invention. Shown is a mouse **10** which has a roller sensor **12** for detecting the movement of a roller or wheel. The sensor signals are provided to a processing circuit in an ASIC **14**. ASIC **14** also receives signals from a mouse sensor **16** and button sensors **18**. Mouse sensor **16** provides detector signals from two encoder rollers on a mouse ball, or alternately an optical signal on an optical mouse.

[**0022**] ASIC **14** also controls two roller actuators **20** and **22** which provide a braking function against the mouse roller or wheel, as will be described below. These actuators receive their power on lines **25** from a USB **24**. Thus, the amount of power used by the actuators needs to be minimized. The sensor signals received by ASIC **14** are put into a packet format and transmitted over USB **24** to a host computer **26** for controlling a display **28**. Host **26** may provide feedback signals back to ASIC **14** in response to the position of a cursor **30** on display **20**, such as being over a graphic icon **32**. Alternately, the feedback can be in response to simple scrolling, zooming, page changes or line changes of the display. Examples of such types of feedback are set forth in U.S. Pat. No. 6,126,006, referenced above, and incorporated herein by reference.

[**0023**] In one mode, instead of a sensor signal being sent to the host, and feedback signals being received back, the host can be bypassed. This is particularly useful for providing a detent feel to rotation of the mouse roller. In prior rollers, this has been done mechanically through the use of a spring mechanism mounted in the mouse. In the present invention, this can be provided through the tactile feedback mechanism using the detent local feedback path indicated by the dotted line **34** in **FIG. 1**. When a roller sensor signal from roller sensor **12** indicates that the roller has been turned a predetermined amount, a signal can be provided to the appropriate roller actuator of roller actuators **20** and **22**. This will provide a brief braking movement so that the user has the feeling of going over a series of detents as the mouse wheel is turned. The use of such local feedback eliminates the need to send data over the USB or over a wireless link, removing bandwidth concerns and also providing more instantaneous feedback. The actuator used for such a local tactile feedback system can be either the partially passive mechanism of the present invention, or an active force feedback mechanism as described in the prior art.

[**0024**] **FIG. 2** is a block diagram of the software used in an embodiment of the present invention. Shown is a mouse **10** with a roller **36**. Inside mouse **10** is a processor or ASIC **14** including a program **38** for controlling the mouse. Sensor signals **40** are provided to host computer **26**, in particular to a driver **42** in the host. The driver in turn can provide signals to an application program **44**, which controls the particular graphics on a display **28**. Upon certain conditions, such as scrolling up a line or page, or over a graphic icon, a tactile feedback signal can be provided from application program **44** to driver **42** and back to ASIC **14** as control commands **46**. In response to these, program **38** provides signals **48** to solenoids, electromagnets, or motors in mouse **10** which control the autoblocking or braking of wheel **36**.

[**0025**] **FIG. 3** is a perspective view of one embodiment of a dual roller braking mechanism according to the invention. The figure shows two motors or solenoids **50** and **52** mounted on a support **54**. Motor **52** includes an axle connected to a pivot arm **56**, which in turn is connected to a roller **58**. When activated by a current applied through a contact **60**, pivot arm **56** will be moved away from a stop pin **62** to bias roller **58** against the mouse wheel **36**. Similarly, motor **50** activates another lever arm to control a second roller **64**. The particular roller chosen depends upon the direction of movement of wheel **36**.

[**0026**] **FIG. 4** shows a side view of the mechanism of **FIG. 3** mounted in a mouse **10**. Looking at **FIG. 4**, when wheel **36** is rotating clockwise, to the right, roller **58** would be biased against it to provide a braking force. Since roller **58** is slightly above the center line of the axis of wheel **36** and the rotating axis of arm **56**, the movement of the wheel **36** against roller **58** will try to push roller **58** downward. This pushing movement will increase the amount of force applied. This in effect magnifies the amount of force felt by the user by harnessing the force generated by the user's own finger, as opposed to requiring significant electrical current generating an opposing force. The present invention allows a minimal amount of current to bias the roller against the mouse wheel, with the majority of the force being supplied by the user's finger itself.

[**0027**] **FIG. 5** is top view showing wheel **36** and motors **50** and **52**, with only roller **58** being visible in this view.

[**0028**] **FIG. 6A** is a side view of a wheel **70** with resistance being provided by a brake shoe **72**. The brake shoe is tilted by moving a shaft **74** up or down. When the user is rotating wheel **70** down toward the brake shoe, in the clockwise or right direction in **FIG. 6**A, the brake shoe is tilted down until it contacts the wheel at a contact point **76**. Continued movement by the user against the wheel will rotate the wheel, with the outer rubber of the wheel deforming, until a contact point **78** is reached. Contact point **78** has a angle greater than a friction angle, such that excessive force by the user will cause the wheel to slip past the brake shoe, avoiding damage to the mechanism.

[**0029**] **FIG. 6B** is a perspective view of the brake shoe **72**. As can be seen, shaft **74** is connected to a member **76** which has a pair of protruding pins **78** and **80**.

[**0030**] Turning to **FIG. 6C, a** diagram is shown of a voice coil **82** having a pair of holes **84** and **86** which mate with pins **78** and **80**. Upon activation of the voice coil, the voice coil will push on one or other of the pins, causing the shaft and brake shoe to rotate. Although the voice coil is a thin, flexible material, it has sufficient rigidity in the plane of the voice coil to move the pins.

[**0031**] **FIG. 6D** is a perspective view of the overall system, including wheel **70** and brake shoe **72** with protruding pins **78** and **80**. The voice coil **82** is mounted in a pole piece **88** having a pair of magnets **90** and **92**. When the voice coil is activated, it will react with the magnets and push on one or the other of the pins, causing the brake shoe to rotate either up or down.

[**0032**] **FIG. 6E** is another perspective view of the arrangement of **FIG. 6**D, this time showing a spring **94**. Spring **94** performs two functions. First, it provides the ratchet effect by contacting the inner, serrated edge of the wheel. Second, it also is biased against the two pins **78** and **80** to return the brake shoe to its center, non-contact position upon deactivation of the voice coil.

[**0033**] **FIG. 7A** is a perspective view of another embodiment of the invention. In **FIG. 7A, a** wheel **94** has a braking